

metal and generates a powerful electric current. The iron is in fact as if it had no attraction for oxygen, and therefore could not act on the electrolyte present, and consequently could produce no current. My strong impression is that the surface of the iron is oxidised, or that the superficial particles of the metal are in such relation to the oxygen of the electrolyte as to be equivalent to an oxidation; and that having thus their affinity for oxygen satisfied, and not being dissolved by the acid under the circumstances, there is no renewal of the metallic surface, no reiteration of the attraction of successive particles of the iron on the elements of successive portions of the electrolyte, and therefore not those successive chemical actions by which the electric current (which is definite in its production as well as in its action) can be continued.

In support of this view, I may observe, that in the first experiment described by Professor Schoenbein, it cannot be doubted that the formation of a coat of oxide over the iron when heated is the cause of its peculiar and inactive state: the coat of oxide is visible by its colour. In the next place, all the forms of experiment by which this iron, or platina, or charcoal, or other voltaic arrangements are used to bring ordinary iron into the peculiar state, are accompanied by a determination of oxygen to the surface of the iron; this is shown by the electric current produced at the first moment, and which in such cases always precedes the change of the iron from the common to the peculiar state. That the coat of oxide produced by common means might be so thin as not to be sensible and yet be effectual, was shown by heating a piece of iron an inch or two from the end,, so that though blue at the heated part, the end did not seem in the slightest degree affected, and yet that end was in the peculiar state. Again, whether the iron be oxidised in the flame much or only to the very slight degree just described, or be brought into the peculiar state by voltaic association with other pieces or with platina, etc., still if a part of its surface were removed even in the smallest degree and then the new surface put into contact with the nitric acid, that part was at the first moment as common iron; the state being abundantly evident by the electrical current

produced at the instant of immersion.

Why the superficial film of oxide, which I suppose to be formed when the iron is brought into the peculiar state by voltaic association, or occasionally by immersion alone into nitric acid, is not dissolved by the acid, is I presume dependent